



National Aeronautics and  
Space Administration

SA-03-02



# Langley Research Center Safety Alert

Date: April 11, 2002

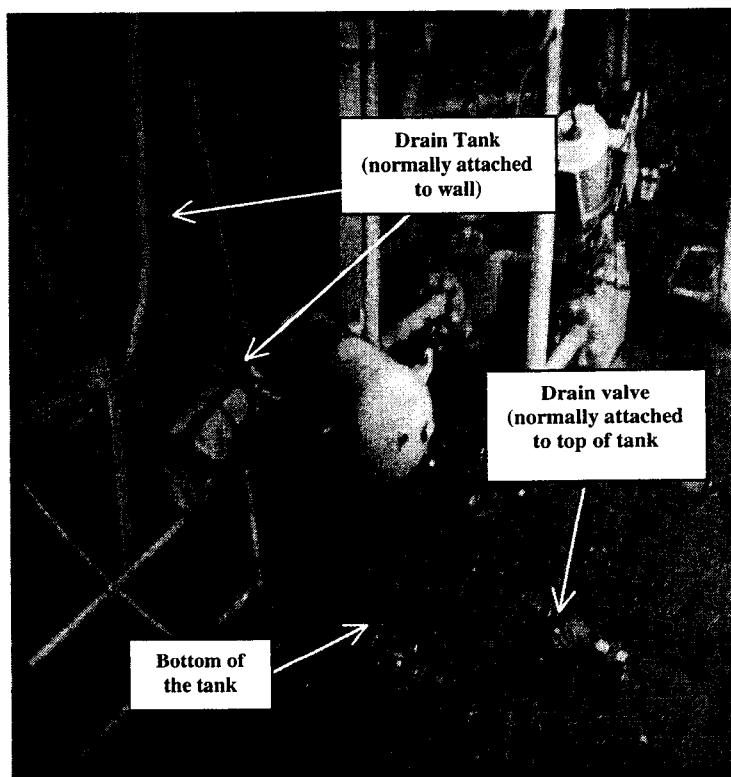
TO: Facility Safety Heads  
Facility Coordinators

FROM: 429/Head, Office of Safety and Facility Assurance, OSMA

SUBJECT: Potential Hazard From Vent, Drain, and Relief Lines

A recent mishap has brought to light the importance of properly designed vent, drain, and relief lines. Even though these lines are directly open to the atmosphere, the potential for overpressurization and rupture exists, as evident by the mishap shown in the figure.


The mishap occurred when a tank located in a section of pipe used to drain water from a 4,300 psi air compressor ruptured. The tank is isolated from the high-pressure air by a manual drain valve. A pipe that exits the bottom of the tank is directly open to the atmosphere. For the past 40 years, operators have been opening the drain valve to drain oil and moisture collectors without incident. On the day of the mishap, an operator drained the system as usual, but when the valve was closed, a very small amount of debris in the valve seat allowed high-pressure air to leak into the low-pressure drain collector tank.



At first glance, rupture of the tank appears to be one-fault tolerant – the drain line would have to clog, and the valve would have to leak. But, the high-pressure air, which contained significant amounts of water, enabled one event to cause both conditions. The valve leaked in a manner that resulted in the Joule-Thompson effect. This caused the high-pressure air to be “throttled” to a lower pressure and much lower temperature (on the order of  $-50^{\circ}\text{F}$ ). The lower temperature caused ice to eventually clog the exit of the tank and degraded the mechanical properties of the carbon steel tank material. With the exit clogged, the pressure inside the tank increased until the weakened tank ruptured.

**(This Safety Alert to be posted on Facility Bulletin Boards for a Minimum of 30 days.)**

Facility Safety Heads (FSH) and Facility Coordinators (FC) are encouraged to survey their facilities and look for vent, drain, and relief lines that may be susceptible to the above scenario. Also, FSHs and FCs need to be aware that the Recertification Contractor has been tasked to identify and review drain, vent, and relief lines as part of their normal pressure systems inspection and configuration management activities during the coming year. The review will be done to ensure these lines are properly designed and incorporated into the facility's configuration controlled pressure systems documents. If a FSH or FC is presently aware of a vent, drain, or relief line that they do not believe is properly designed, please contact the Langley Pressure Systems Manager, Carlos S. Perez-Ramos at 47258 so that the appropriate investigation can be initiated on its operational safety.

  
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